

WHAT IS CLAIMED IS:

1. A thermoelectric system comprising:
at least one thermoelectric element with at least one first side and at least one second side exhibiting a temperature gradient between them during operation, wherein the at least one thermoelectric element is configured to permit flow of at least one convective medium through the at least one element to provide generally steady-state convective heat transport toward at least one side of the thermoelectric element.
2. The thermoelectric system of Claim 1, wherein the at least one convective medium flows through the at least one thermoelectric element.
3. The thermoelectric system of claim 2, wherein the at least one thermoelectric element is permeable.
4. The thermoelectric system of Claim 3, wherein the at least one thermoelectric element is porous.
5. The thermoelectric system of Claim 2, wherein the at least one thermoelectric element is tubular.
6. The thermoelectric system of Claim 2, wherein the at least one convective medium flows through the at least one thermoelectric element in a single general direction.
7. The thermoelectric system of Claim 6, wherein the at least one convective medium flows generally from between the first and the second sides toward the first side or toward the second side.
8. The thermoelectric system of Claim 2, wherein the at least one convective medium flows generally from the first side to the second side.
9. The thermoelectric system of Claim 2, wherein the at least one convective medium flows generally from the second side to the first side.
10. The thermoelectric system of Claim 2, wherein the at least one convective medium flows through the at least one thermoelectric element in at least two general directions.
11. The thermoelectric system of Claim 10, wherein the at least one convective medium flows generally from between the first side and the second side toward the first side and toward the second side.

12. The thermoelectric system of Claim 1, wherein the at least one convective medium flows along the at least one thermoelectric element.

13. The thermoelectric system of Claim 12, wherein the at least one convective medium flows along the at least one thermoelectric element in a single general direction.

14. The thermoelectric system of Claim 13, wherein the at least one convective medium flows generally from between the first side and the second side toward the first side or toward the second side.

15. The thermoelectric system of Claim 12, wherein the at least one convective medium flows generally from the first side to the second side.

16. The thermoelectric system of Claim 12, wherein the at least one convective medium flows generally from the second side to the first side.

17. The thermoelectric system of Claim 12, wherein the at least one convective medium flows along the at least one thermoelectric element in at least two general directions.

18. The thermoelectric system of Claim 17, wherein the at least one convective medium flows generally from between the first side and the second side toward the first side and toward the second side.

19. The thermoelectric system of Claim 12, further comprising at least one additional thermoelectric element.

20. The thermoelectric system of Claim 19, wherein the at least two thermoelectric elements form concentric tubes with the convective medium flow between the concentric tubes.

21. The thermoelectric system of Claim 20, wherein the tubes concentrically alternate between p-type thermoelectric material and n-type thermoelectric material.

22. The thermoelectric system of Claim 20, wherein a first set of concentric tubes are of the same first type of thermoelectric material, and a second set of concentric tubes are of the same second type of thermoelectric material.

23. The thermoelectric system of Claim 1, wherein at least part of the convective medium is a thermoelectric material, said convective medium thermoelectric material also forming at least a portion of the thermoelectric element.

24. The thermoelectric system of Claim 1, wherein at least part of the convective medium is a thermoelectric material, said convective medium thermoelectric material forming a first portion of at least a portion of the thermoelectric element, and a solid thermoelectric material forming a second portion of the thermoelectric element.

25. The thermoelectric system of Claim 24, wherein the solid thermoelectric material is tubular, and the convective medium thermoelectric material flows through the solid tubular thermoelectric material, the combination forming the thermoelectric element.

26. The thermoelectric system of Claim 1, wherein at least part of the convective medium is a fluid.

27. The thermoelectric system of Claim 26, wherein at least a portion of the convective medium is air.

28. The thermoelectric system of Claim 1, wherein at least part of the convective medium is a solid.

29. The thermoelectric system of Claim 1, wherein at least part of the convective medium is a mixture of fluid and solid.

30. The thermoelectric system of claim 1, wherein at least a portion of the thermoelectric element comprises at least one heat transfer feature that improves heat transfer between at least some of the at least one convective medium and the at least one thermoelectric element.

31. The thermoelectric system of claim 30, wherein the at least one thermoelectric element is tubular, and wherein the heat transfer feature is inside the tubular thermoelectric element.

32. The thermoelectric system of Claim 30 wherein the heat transfer feature is a convective medium flow disturbing feature.

33. The thermoelectric system of Claim 1, wherein the system is used for cooling.

34. The thermoelectric system of Claim 1, wherein the system is used for heating.

35. The thermoelectric system of Claim 1, wherein the system is used for both cooling and heating.

36. A method of improving efficiency in a thermoelectric system having at least one thermoelectric element having at least one first side and at least one second side

exhibiting a temperature gradient between them during operation, the method comprising the step of actively convecting heat through the at least one thermoelectric element in a generally steady-state manner.

37. The method of Claim 36, wherein the step of convecting heat comprises flowing at least one convective medium through the at least one thermoelectric element.

38. The method of Claim 37, wherein the at least one thermoelectric element is permeable.

39. The method of Claim 38, wherein the at least one thermoelectric element is porous.

40. The method of Claim 37, wherein the at least one thermoelectric element is tubular.

41. The method of Claim 37, wherein the step of flowing comprises flowing the at least one convective medium generally from the first side to the second side.

42. The method of Claim 37, wherein the step of flowing comprises flowing the at least one convective medium generally from between the first side and the second side toward the first side or toward the second side.

43. The method of Claim 37, wherein the step of flowing comprises flowing the at least one convective medium in at least two general directions.

44. The method of Claim 43, wherein the step of flowing comprises flowing the at least one convective medium generally from between the first side and the second side toward the first side and toward the second side.

45. The method of Claim 44, wherein the step of flowing comprises flowing at least some of the convective medium through the at least one thermoelectric element.

46. The method of Claim 44, wherein the step of flowing comprises flowing at least some of the convective medium along the at least one thermoelectric element.

47. The method of Claim 37, wherein the step of flowing further comprises flowing at least some of the convective medium between a concentric tube formed by the at least one thermoelectric element with at least one other thermoelectric element having a similar shape.

48. The method of Claim 37, wherein at least a portion of the convective medium is a fluid.
49. The method of Claim 48, wherein at least a portion of the convective medium is air.
50. The method of Claim 37, wherein at least a portion of the convective medium is a solid.
51. The method of Claim 37, wherein at least a portion of the convective medium is a mixture of fluid and solid.
52. The method of Claim 36, wherein the thermoelectric system is used for cooling.
53. The method of Claim 36, wherein the thermoelectric system is used for heating.
54. The method of Claim 36, wherein the thermoelectric system is used for both cooling and heating.
55. A thermoelectric system comprising:
at least one thermoelectric element having at least one first side and at least one second side exhibiting a temperature gradient between them during operation, wherein at least a portion of the thermoelectric element is configured to permit flow of at least one convective medium through the at least a portion of the element to provide generally steady-state convection toward at least one side of the thermoelectric element; and
at least one control system, said control system comprising:
at least one controller,
at least one input coupled to at least one controller, and
at least one output coupled to at least one controller and to said thermoelectric element, said output controllable by said controller to modify at least one characteristic of said thermoelectric element.
56. The thermoelectric system of Claim 55, wherein the at least one characteristic impacts the convective heat transport, and wherein the adjustment improves efficiency by adjusting the characteristic.

57. The thermoelectric system of Claim 55, wherein the control system varies movement of at least some of the convective medium in response to said input.

58. The thermoelectric system of Claim 55, wherein the control system varies at least the current through the at least one thermoelectric element.

59. The thermoelectric system of Claim 55, wherein the at least one input comprises at least one external sensor.

60. The thermoelectric system of Claim 55, wherein the at least one input comprises at least one sensor internal to the at least one thermoelectric element.

61. The thermoelectric system of Claim 55, wherein the at least one input comprises at least one sensor internal to the thermoelectric element, at least one external sensor and at least one user selectable input.

62. The thermoelectric system of Claim 55, wherein the at least one input is a user selectable input.

63. The thermoelectric system of Claim 55, wherein at least one controller operates in accordance with at least one algorithm responsive to the at least one input to control the at least one output.